

WE CLAIM:

1. A method for generating diagnostic data signals by a first transceiver and a second transceiver operatively coupled via a communications link, the communications link including a plurality of channels, the method comprising:

transmitting by the first transceiver to the second transceiver a first pulse signal via a first channel of the plurality of channels;

transmitting by the second transceiver to the first transceiver a second pulse signal via a second channel of the plurality of channels;

while continuously transmitting by the first transceiver the first pulse signal and by the second transceiver the second pulse signal, performing:

transmitting by the first transceiver a test signal into the communications link; and

receiving by the first transceiver via the communications link a data signal generated within the communications link in response to the test signal.

2. The method of claim 1, wherein the first pulse signals and the second pulse signals are periodic.

3. The method of claim 1, further comprising storing the data signal received by the first transceiver.

4. The method of claim 1, wherein the data signal is an ECHO crosstalk data signal.

5. The method of claim 1, wherein the data signal is a near end crosstalk data signal.

6. A method for generating diagnostic data signals by a first and a second transceiver operatively coupled via a communications link, the communications link including a plurality of channels, the method comprising:

transmitting by the first transceiver to the second transceiver a pulse signal via a first channel of the plurality of channels;

transmitting by the second transceiver to the first transceiver an idle signal via a second channel of the plurality of channels;

while continuously transmitting the pulse signal by the first transceiver and the idle signal by the second transceiver, performing:

transmitting by the first transceiver to the second transceiver a command signal via a third channel of the plurality of channels;

receiving at the second transceiver from the first transceiver the command signal;

transmitting by the second transceiver into the communications link a test signal, the test signal is generated by the second transceiver using the command signal; and

receiving at the first transceiver from the communications link a data signal generated within the communications link in response to the test signal.

7. The method of claim 6, the method further comprising:

selecting by the first transceiver a selected channel from the plurality of channels;

including by the first transceiver a selected channel identification in the command signal;

decoding the selected channel identification from the command signal performed by the second transceiver;

decoding test pulse width from the command signal performed by the second transceiver; and

transmitting by the second transceiver the test signal into the communications link using the selected channel.

8. The method of 7, wherein selecting by the first transceiver a selected channel from the plurality of channels includes:

determining a converged channel for which a first decision feedback equalizer included in the first transceiver and a second decision feedback equalizer included in the second transceiver have converged; and

using the converged channel as the selected channel.

9. The method of claim 6, wherein the data signal is a far end crosstalk data signal.

10. The method of claim 6, wherein the pulse signal is periodic.

11. The method of claim 6, further comprising storing the data signal.

12. A method for generating diagnostic data signals by a transceiver operatively coupled to a communications link, the communications link including a plurality of channels, the method comprising:

determining by the transceiver that no other transceivers are coupled to the communications link;

transmitting by the transceiver into the communications link a test signal; and

receiving by the first transceiver from the communications link a data signal generated within the communications link in response to the test signal.

13. The method of claim 12, further comprising storing the data signal.

14. The method of claim 12, wherein the data signal is an ECHO crosstalk data signal.

15. The method of claim 12, wherein the data signal is a near end crosstalk data signal.

16. A method for generating diagnostic data signals by a first transceiver operatively coupled to a communications link, the communications link including a plurality of channels, the method comprising:

transmitting by the first transceiver to a second transceiver a first pulse signal via a first channel of the plurality of channels;

receiving by the first transceiver from the second transceiver a second pulse signal via a second channel of the plurality of channels;

while continuously transmitting by the first transceiver the first pulse signal and receiving by the first transceiver the second pulse signal, performing:

transmitting by the first transceiver a test signal into the communications link; and

receiving by the first transceiver via the communications link a data signal generated within the communications link in response to the test signal.

17. The method of claim 16, wherein the first and second pulse signals are periodic.

18. The method of claim 16, further comprising storing the data signal.

19. The method of claim 16, wherein the data signal is an ECHO crosstalk data signal.

20. The method of claim 16, wherein the data signal is a near end crosstalk data signal.

21. A method for generating diagnostic data signals by a first transceiver operatively coupled to a communications link, the communications link including a plurality of channels, the method comprising:

transmitting by the first transceiver to a second transceiver a first pulse signal via a first channel of the plurality of channels;

receiving by the first transceiver from the second transceiver an idle signal via a second channel of the plurality of channels;

while continuously transmitting by the first transceiver the pulse signal and receiving by the transceiver the idle signal, performing:

transmitting by the first transceiver to the second transceiver a command signal via a third channel of the plurality of channels; and

receiving by the first transceiver from the communications link a data signal generated within the communications link by a test signal transmitted by the second transceiver into the communications link in response to the command signal.

22. The method of claim 21, the method further comprising:

selecting by the first transceiver a selected channel from the plurality of channels; and

decoding test pulse width from the command signal performed by the second transceiver; and

including by the first transceiver a selected channel identification in the command signal.

23. The method of 22, wherein selecting by the first transceiver a selected channel from the plurality of channels includes:

determining a converged channel for which a decision feedback equalizer included in the transceiver and a second decision feedback equalizer included in the second transceiver have converged; and

using the converged channel as the selected channel.

24. The method of claim 21, wherein the data signal is a far end crosstalk data signal.

25. The method of claim 21, wherein the pulse signal is periodic.

26. The method of claim 21, further comprising storing the data signal.

27. A method for generating diagnostic data signals by a first transceiver assisted by a second transceiver operatively coupled via a communications link, the communications link including a plurality of channels, the method comprising:

transmitting by the first transceiver to the second transceiver a first periodic pulse signal via a first channel of the plurality of channels;

transmitting by the second transceiver to the first transceiver a second periodic pulse signal via a second channel of the plurality of channels;

while continuously transmitting the first and second periodic pulse signals by the first and second transceivers respectively, performing:

transmitting by the first transceiver a test signal via a third channel of the plurality of channels; and

receiving by the first transceiver via a fourth channel of the plurality of channels a near end cross talk data signal generated within the communications link in response to the test signal.

28. The method of claim 27, wherein the first and second transceivers are controlled by a first and second state machine respectively, the method further comprising an autonegotiation process whereby the first and second state machines become master and slave diagnostic state machines.

29. A method for generating diagnostic data signals by a first transceiver assisted by a second transceiver operatively coupled via a communications link, the communications link including a plurality of channels, the method comprising:

transmitting by the first transceiver to the second transceiver a first periodic pulse signal via a first channel of the plurality of channels;

transmitting by the second transceiver to the first transceiver a second periodic pulse signal via a second channel of the plurality of channels;

while continuously transmitting the first and second periodic pulse signals by the first and second transceivers respectively, performing the following steps:

transmitting by the first transceiver a test signal via a third channel of the plurality of channels; and

receiving by the first transceiver via the communications link a data signal generated within the communications link in response to the test signal.

30. The method of claim 29, wherein the first and second transceivers are controlled by a first and second state machine respectively, the method further comprising an autonegotiation process whereby the first and second state machines become master and slave diagnostic state machines.

31. A method for generating diagnostic data signals by a first transceiver assisted by a second transceiver operatively coupled via a communications link, the communications link including a plurality of channels, the method comprising:

transmitting by the second transceiver to the first transceiver an idle signal via a first channel of the plurality of channels;

transmitting by the first transceiver to the second transceiver a periodic pulse signal via a second channel of the plurality of channels;

while continuously transmitting the pulse signal and idle signal by the first and second transceivers respectively, performing the following steps:

selecting by the first transceiver a selected channel from the plurality of channels;

generating by the first transceiver a command signal using an identification of the selected channel;

transmitting by the first transceiver to the second transceiver the command signal via a third channel of the plurality of channels;

receiving by the second transceiver from the first transceiver the command signal;

determining by the second transceiver the selected channel using the command signal;

transmitting by the second transceiver into the communications link via the selected channel a test signal; and

receiving by the first transceiver from a channel of the plurality of channels a far end cross talk data signal generated within the communications link in response to the test signal.

32. The method of claim 31, wherein the first and second transceivers are controlled by a first and second state machine respectively, the method further comprising an autonegotiation process whereby the first and second state machines become master and slave diagnostic state machines.

33. A diagnostic data signal generator apparatus for a communications system having a first transceiver and a second transceiver coupled therebetween by a communications link having a plurality of channels comprising:

a first transceiver controller controlling transmission of a first pulse signal transmitted by the first transceiver to the second transceiver over a first channel of the plurality of channels;

a second transceiver controller controlling transmission of a second pulse signal transmitted by the second transceiver over a second channel of the plurality of channels;

the first transceiver controller controlling transmission by the first transceiver onto the communications link of a test signal;

the first transceiver receiving a data signal generated within the communications link in response to the test signal; and

the first pulse signal and the second pulse signal being periodic and continuously transmitted while the first transceiver transmits the test signal and receives the data signal.

34. The diagnostic data signal generator apparatus of claim 33, wherein the first transceiver controller includes a master diagnostic state machine controlling the first transceiver and the second transceiver controller includes a slave diagnostic state machine controlling the second transceiver.

35. The diagnostic data signal generator apparatus of claim 33, further comprising a data storage coupled to the first transceiver controller for storing the data signal received by the first transceiver controller.

36. The diagnostic data signal generator apparatus of claim 33, wherein the data signal is an ECHO crosstalk data signal.

37. The diagnostic data signal generator apparatus of claim 33, wherein the data signal is a near end crosstalk data signal.

38. A diagnostic data signal generator apparatus for a communications system having a first transceiver and a second transceiver coupled therebetween by a communications link having a plurality of channels comprising:

a master diagnostic state machine controlling transmission of a first pulse signal by the first transceiver, the master diagnostic state machine being coupled through the first transceiver to the second transceiver via a first channel of the plurality of channels; and



a slave diagnostic state machine controlling transmission of a second pulse signal by the second transceiver, the slave diagnostic state machine being coupled through the second transceiver to the first transceiver via a second channel of the plurality of channels;

the first transceiver transmitting into the communications link a test signal;

the first transceiver receiving a data signal generated within the communications link in response to the test signal; and

the first pulse signal and the second pulse signal being periodic and continuously transmitted while the master diagnostic state machine controls transmission of the test signal and reception of the data signal.

39. The diagnostic data signal generator apparatus of claim 38, further comprising a data storage coupled to the master diagnostic state machine for storing the data signal received by the master diagnostic state machine.

40. The diagnostic data signal generator apparatus of claim 38, wherein the data signal is an ECHO crosstalk data signal.

41. The diagnostic data signal generator apparatus of claim 38, wherein the data signal is a near end crosstalk data signal.

42. A diagnostic data signal generator apparatus for a communications system having a first transceiver and a second transceiver coupled therebetween by a communications link having a plurality of channels comprising:

a first transceiver controller controlling transmission of a pulse signal by the first transceiver to the second transceiver over a first channel of the plurality of channels; and

a second transceiver controller controlling transmission of an idle signal by the second transceiver over a second channel of the plurality of channels;

the first transceiver controller controlling transmission by the first transceiver to the second transceiver a command signal via a third channel of the plurality of channels;

the second transceiver controller controlling reception by the second transceiver from the first transceiver the command signal;

the second transceiver controller controlling transmission by the second transceiver into the communications link of a test signal, the test signal generated by the second transceiver using the command signal; and

the first transceiver controller controlling reception by the first transceiver from the communications link of a data signal generated within the communications link in response to the test signal; and

the pulse signal and the idle signal being continuously transmitted while the first transceiver controller controls transmission of the command signal and reception of the data signal and the second transceiver controller controls reception of the command signal and transmission of the test signal.

43. The diagnostic data signal generator apparatus of claim 42, wherein the first transceiver controller includes a master diagnostic state machine controlling the first transceiver and the second transceiver controller includes a slave diagnostic state machine controlling the second transceiver.

44. The diagnostic data signal generator apparatus of claim 42, further comprising a data storage coupled to the first transceiver controller for storing the data signal by the first transceiver controller.

45. The diagnostic data signal generator apparatus of claim 42, wherein the data signal is a far end crosstalk data signal.

46. A diagnostic data signal generator apparatus for a communications system having a first transceiver and a second transceiver coupled therebetween by a communications link having a plurality of channels comprising:

a master diagnostic state machine controlling transmission of a periodic pulse signal, the master diagnostic state machine being coupled through the first transceiver to the second transceiver via a first channel of the plurality of channels;

a slave diagnostic state machine controlling transmission of a periodic idle signal by the second transceiver, the slave diagnostic state machine being coupled

through the second transceiver to the first transceiver via a second channel of the plurality of channels;

the master diagnostic state machine controlling transmission by the first transceiver to the second transceiver a command signal via a third channel of the plurality of channels;

the slave diagnostic state machine controlling reception by the second transceiver from the first transceiver the command signal;

the slave diagnostic state machine controlling transmission by the second transceiver into the communications link of a test signal, the test signal generated by the second transceiver using the command signal;

the master state machine controlling reception by the first transceiver from the communications link of a far cross talk data signal generated within the communications link in response to the test signal; and

the pulse signal and the idle signal being continuously transmitted while the master diagnostic state machine controls transmission of the command signal and reception of the far end crosstalk data signal and the slave diagnostic state machine controls reception of the command signal and transmission of the test signal.

47. The diagnostic data signal generator apparatus of claim 46, further comprising a data storage coupled to the master diagnostic state machine for storing the data signal received by the master diagnostic state machine.